

(2)

(19)

**Europäisches Patentamt**  
**European Patent Office**  
**Office européen des brevets**



EP 1 653 374 A3

(12)

# EUROPEAN PATENT APPLICATION

(88) Date of publication A3:  
26.07.2006 Bulletin 2006/30

(51) Int Cl.:

(43) Date of publication A2:  
03.05.2006 Bulletin 2006/18

(21) Application number: 05022021.9

(22) Date of filing: 23.04.2002

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE TR  
Designated Extension States:  
AL LT LV MK RO SI

(30) Priority: 24.04.2001 US 841911  
22.10.2001 US 53340

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:  
**02009032.0 / 1 291 778**

(71) Applicant: **Rambus, Inc.**  
**Los Altos, CA 94022 (US)**

(72) Inventors:

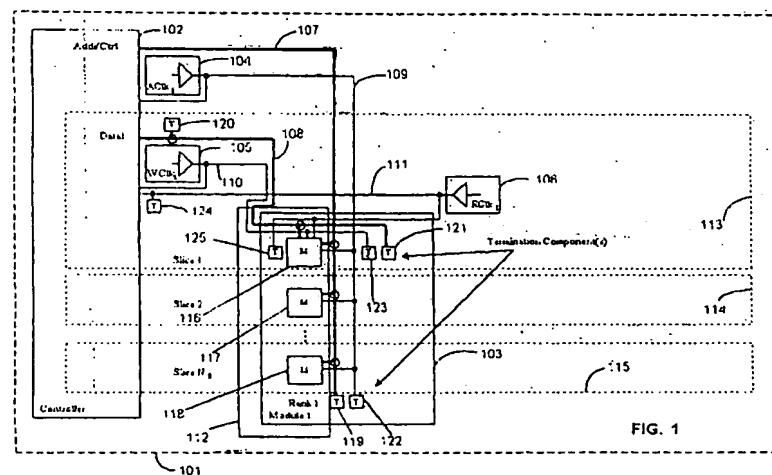
- Ware, Frederick A.  
Los Altos, CA 94022 (US)
- Tsern, Ely K.  
Los Altos, CA 94022 (US)
- Perego, Richard E.  
San Jose, CA 95134 (US)
- Hampel, Craig E.  
Los Altos, CA 94024 (US)

(74) Representative: Eisenführ, Speiser & Partner  
Patentanwälte Rechtsanwälte  
Postfach 10 60 78  
28060 Bremen (DE)

(54) **Method and apparatus for coordinating memory operations among diversely-located memory components**

(57) A method and apparatus for coordinating memory operations among diversely-located memory components is described. In accordance with an embodiment of the invention, wave-pipelining is implemented for an address bus coupled, to a plurality of memory components.

nents. The plurality of memory components are configured according to coordinates relating to the address bus propagation delay and the data bus propagation delay. A timing signal associated with address and/or control signals which duplicates the propagation delay of these signals is used to coordinate memory operations.





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	US 6 125 419 A (UMEMURA ET AL) 26 September 2000 (2000-09-26) * column 16, line 34 - column 17, line 34; figures 14,16 * * column 23, line 32 - line 53; figure 25 * ----- A US 5 892 981 A (WIGGERS ET AL) 6 April 1999 (1999-04-06) * abstract * * column 4, line 42 - line 54 * ----- A WO 99/41667 A (INTEL CORPORATION; HOLMAN, THOMAS, J) 19 August 1999 (1999-08-19) * page 2, paragraph 2 * * page 14, paragraph 2; figure 3 * * figure 12 * ----- A EP 0 735 492 A (MOTOROLA, INC) 2 October 1996 (1996-10-02) * column 2, line 55 - column 3, line 28 * * figures 1-3 * -----	1-18	INV. G06F13/16
			TECHNICAL FIELDS SEARCHED (IPC)
			G06F
The present search report has been drawn up for all claims			
5	Place of search Munich	Date of completion of the search 1 June 2006	Examiner Jünger, B
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 05 02 2021

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-06-2006

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 6125419	A	26-09-2000	NONE		
US 5892981	A	06-04-1999	DE DE EP JP WO	69709885 D1 69709885 T2 0931291 A1 2001505684 T 9815897 A1	28-02-2002 27-06-2002 28-07-1999 24-04-2001 16-04-1998
WO 9941667	A	19-08-1999	AU DE GB HK US	2483099 A 19982871 T0 2349965 A 1028467 A1 6968419 B1	30-08-1999 29-03-2001 15-11-2000 24-10-2003 22-11-2005
EP 0735492	A	02-10-1996	JP JP TW US	3616453 B2 8287008 A 594479 B 5638520 A	02-02-2005 01-11-1996 21-06-2004 10-06-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82



Bescheid/Protokoll (Anlage)	Communication/Minutes (Annex)	Notification/Procès-verbal (Annexe)
Datum Date Date Cf Form 1507	Blatt Sheet Feuille 1	Anmelde-Nr.: Application No.: 05 022 021.9 Demande n°:

The examination is being carried out on the **following application documents**:

**Description, Pages**

1-98 as originally filed

**Claims, Numbers**

1-18 as originally filed

**Drawings, Sheets**

1-34 as originally filed

Reference is made to the following document/s; the numbering will be adhered to in the rest of the procedure:

D1: US-A-6 125 419 (UMEMURA ET AL) 26 September 2000 (2000-09-26)

- 1 The divisional application does not comply with Article 76 because it extends beyond the content of the earlier application as filed. The reasons being as follows:
  - 1.1 The earlier application as filed, discloses e.g. in figure 32 and associated text a memory system similar to the subject matter of claim 1, wherein each control/address wire is routed onto a memory module, past all the memory components, and into a termination component.
  - 1.2 However, the claim features "a third plurality of signal lines" which also covers other signal lines than control/address signal lines and therefore extends beyond the content of the earlier application as filed.
- 2 Under Article 84 in combination with Rule 29(2) EPC an application may contain more than one independent claim in a particular category only if the subject matter claimed falls within one or more of the exceptional situations set out in paragraphs (a), (b) or (c) of Rule 29(2) EPC. The independent system claims 1 and 14 however, do not fulfil any of the conditions (a) to (c) of this Rule.

These claims define a memory system for essentially the same object and not for objects that work together. Hence, they are not inter-related systems nor different uses of a product or apparatus.

The memory systems also cannot be considered as alternative solutions to a particular problem in the sense of different or even mutually exclusive possibilities.



Beschluß/Protokoll (Anlage)	Communication/Minutes (Annex)	Notification/Procès-verbal (Annexe)
Datum Date Date	cf Form 1507	Blatt Sheet Feuille

2

Anmelde-Nr.: Application No.: 05 022 021.9  
Demande n°:

but to one and the same solution with slightly different wording and level of detail.

Moreover, the examining division does not see any reason why it should not be possible, practical or otherwise not be appropriate to cover the subject matter by a single independent claim. It is considered entirely appropriate to select a common wording for the essential features and draft a single independent claim with dependent claims as necessary.

- 3 The present application does not meet the requirements of Article 52(1) EPC, because the subject-matter of claim 1 is not new in the sense of Article 54(1) and (2) EPC. The document D1 discloses all features of claim 1 (the references in parentheses applying to this document):
  - a) A memory system (fig. 14) comprising a first memory device (fig. 14, #1) and a first plurality of signal lines coupled to the first memory device, the first plurality of signal lines dedicated to data transfers involving the first memory device (fig. 14, data bus signal lines connected at memory device #1)
  - b) the memory system further comprises a second memory device (fig. 14, #3) and a second plurality of signal lines coupled to the second memory device, the second plurality of signal lines dedicated to data transfers involving the second memory device (fig. 14, data bus signal lines connected at memory device #3)
  - c) a first termination component (fig. 15, item 59b)
  - d) a third plurality of signal lines coupled to the first memory device, the second memory device, and the first termination component such that a signal propagating on the third plurality of signal lines propagates past the first memory device before reaching the second memory device and propagates past the second memory device before reaching the first termination component (fig. 16, item 5b and col. 16 l. 34-col. 17 l. 34 and fig. 25)

Remark: The topology shown in the figures implies the signal propagation as claimed in feature d).

- 4 In the dependent claims a number of minor modifications to the memory system of claim 1 are set out, all of which, when not directly deductible from the teachings of



Beschied/Protokoll (Anlage)	Communication/Minutes (Annex)	Notification/Procès-verbal (Annexe)
Datum Date Date	CF Form 1507	Blatt Sheet Feuille

3

Anmelde-Nr.: 05 022 021.9  
Application No.: Demande n°:

document D1 relate to routine measures normally to be expected from the skilled person. It thus appears that all features of the dependent claims are either known from or rendered obvious by the prior art (Art. 54 and 56 EPC).

5 It is not at present apparent which part of the application could serve as a basis for a new, allowable claim. Should the applicant nevertheless regard some particular matter as patentable he is invited to file an independent claim including such matter.

In that case

- 5.1 The applicant is requested to clearly identify all amendments made and indicate from which passages of the original application these amendments are directly and unambiguously derivable (Article 123(2) EPC and Guidelines C-VI, 5.3.1 and E-II, 1). If the applicant regards it as appropriate these indications could be submitted in handwritten form on a copy of the relevant parts of the application as filed.
- 5.2 The applicant should not only indicate in the letter of reply the difference of the subject-matter of the new claim vis-a-vis the state of the art, but should also especially indicate the technical effect achieved thereof as well as the reasons for which the claimed matter should contribute to an inventive step (problem/solution approach) over the available prior art D1.
- 5.3 D1 is considered as most relevant source of prior art. The independent claims should be drafted in two-part form (Rule 29(1) EPC) using the words "characterized by", with those features which in combination are known from D1 being placed in the preamble.
- 5.4 D1 should be acknowledged in the introductory part of the description (Rule 27 (1) (b) EPC).
- 5.5 All claims should contain reference signs (Rule 29(7) EPC).
- 5.6 The description should be adapted to the new claims to be filed (Rule 27(1)(c) EPC).
- 5.7 The statement referring to the spirit and scope of the invention in the description at page 86 is inconsistent with the definition of the matter for which protection is sought, contrary to Article 84 EPC. The statement should therefore be deleted.